

AUTHOR: Sheftal', N. N., Doctor of Geologico-Mineralogical Sciences. 30-11-20/23

TITLE: Third Conference on Monocrystals in Czechoslovakia
(Tret'ya konferentsiya po monokristallam v Chekhoslovakii)

PERIODICAL: Vestnik AN SSSR, 1957, Vol. 27, Nr 11, pp. 133-134 (USSR)

ABSTRACT: At the end of June the above-mentioned conference was held in Turnov. The papers read during the plenary session and in the different sections (theoretical and experimental works, technology, treatment of crystals, apparatus and equipment) indicated the high research-level of the Czechoslovak scientists. The works by Ya. Kashpar (on the growth of the carbonate group from calcite to nickel containing carbon dioxide) were interesting. Some of these crystals are found in nature as certain minerals - others as isomorphous admixtures or not at all. Excellent results were obtained by engineer Ch. Bartu with regard to the synthesis from the melting process according to Verneyl's method (where he obtained crystal-products which surpassed diamonds of purest water without yellowish shades). Besides he obtained transparent crystals (sheyelite) with a diameter of up to 20 mm, crystals of scandium-oxide (melting temperature 2300°C) with a length up to 45 mm. Besides

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successful experiments of the synthesis according to Vern-eyl's method of the crystals CdWO_4 with best luminescent properties. The investigations made by I. Shmid in connection with the elaboration of existing methods of the crystals ADR (dehydrophosphate of ammonium), produced from solutions and soluble in H_2O , also were of interest. Works were begun on the production of smallest crystals WO_3 (I. Ganzlik) from the melting of the monocrystals $3,5 \text{ SiFe}$ (F. Shostak), the crystals of the amalgam polonium-mercury (I. Kaurzhimskiy and Ye. Fil'chakova). The participants in the conference also thoroughly dealt with the apparatus and the equipment of laboratories. The Czechoslovak researchers succeeded in precisely determining the temperature control to $0,1^\circ\text{C}$ at 1000°C (V. Vaniček). Valuable informations was given by I. Kotlyar regarding the processing of crystals. I. Sholts reported on data concerning the orientation of crystal-plates with an accuracy to $1'$ by means of an X-ray spectrograph. Z. Dragonevskiy spoke on the tests of producing Arensian polarizers, P. Vidner on the melting of technically pure quartz glass and F. Vitak on the production and processing of quartz fibers. Great interest was shown for the papers read by the Soviet delegates concerning the apparatus for the synthesis with excess pressure, the pro-

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blems of the solubility of quartz, the influence of supersaturation and temperature on the form of the crystals, the spiral growth of the crystals and the different methods of growth in the industrial laboratories of the USSR.

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AUTHOR: SHEFTAL, N. 53-2-7/9
TITLE: V.D. KUZNETSOV. "Crystals and Crystallization" ("Kristally i kristallizatsiya", Russian), State Publishing House for Theoretical, Technical Literature, Moscow, 1954, 411 p, 19 roubles.
PERIODICAL: Uspekhi Fiz. Nauk, 1957, Vol 62, Nr 2, pp 187 - 191 (U.S.S.R.)
ABSTRACT: N. Sheftal discusses the book "Crystals and Crystallization", which is a continuation in supplementation of the book by the same author on "Physics of Solids" published 1937.
The book has 6 chapters:
1) Formation of Crystals
2) Growth and Dissolution of crystals
3) Real crystals
4) The part played by surface energy and additions
5) Allotropy, polymorphosm, isomorphsm
6) Artificial crystal breeding.
The reviewer is of the opinion that in this book the experimental part is more important than the theoretical part, and that the author brings no new ideas, with the only exception of perhaps the mechanism of the influence of additions in connection with crystallization. Theoretical works of the last ten years are nearly completely neglected. The book lacks compactness. In

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V.D.KUZNETSOV: "Crystals and Crystallization".

spite of certain deficiencies the book is, however, valuable, because it is the first of its kind and gives at least a useful survey of this difficult matter.

ASSOCIATION: Not given

PRESENTED BY:

SUBMITTED:

AVAILABLE: Library of Congress

Card 2/2

53-258/9

AUTHOR:

SHEFTAL, N.

TITLE:

H. Buckley: "The Growth of Crystals", 1951.

(G. BAKLI: Rost kristallov, Russian).

(Translation from the English language by M.A. Kulakov under the Editorship of O.M. Ansheles and V.A. Frank-Kamenetskogo.

Publishing House for Foreign Literature, Moscow 1954, 406 pp).

Uspekhi Fiz. Nauk, 1957, Vol 62, Nr 2, pp 191 - 196 (U.S.S.R.)

PERIODICAL:

ABSTRACT:

The book "The Growth of Crystals" has 12 chapters:

- 1) Solution, solubility, saturation.
- 2) Artificial crystal breeding.
- 3) The theory of crystal growth by Curie.
- 4) On the so-called velocity of growth.
- 5) Theory of diffusion.
- 6) Present theories of growth.
- 7) Ideal and real crystal.
- 8) Various types of crystallization.
- 9) Dissolution.
- 10) The influence exercised by additions on the shape of crystals.
- 11) The influence exercised by various materials on crystallization.
- 12) Peculiar features of crystal growth.

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H. Buckley: "The Growth of Crystals"

The reviewer, N. SHEFTAL, says about this book: "The theoretical side of the growth of crystals is not very clearly described, and such new developments as the dislocation theory (1949), the spiral-shaped crystal growth (1950), the molecular kinetic theory (1950) are disregarded. In view of these and other shortcomings BAKLI's book is only of limited value.

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

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S/564/57/000/000/019/029
D258/D307

AUTHORS: Kapralov, K. V., Koritskiy, Yu. V., and
Sheftal', N. N.

TITLE: First attempts at growing large crystals of
mica

SOURCE: Rost kristallov; doklady na Pervom soveshchanii
po rostu kristallov, 1956 g. Moscow, Izd-vo
AN SSSR, 1957, 273-276

TEXT: The present work was carried out in 1947-1949 in
Laboratoriya slyudyany izolyatsii Bessoyuznogo elektro-
tekhnicheskogo instituta (Mica Insulation Laboratory of the
All-Union Electrotechnical Institute), (Kapralov and Koritskiy),
with consultations from Sheftal' of Institut kristallografii
AN SSSR (Crystallography Institute of the AS USSR). In 1947
preliminary fusions with unspecialized apparatus showed that
graphite was the best crucible material (in CO at 1400°C). The

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First attempts...

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period 1948-1949 was spent in construction of special furnaces. Small mica crystals containing 16 - 50% of glass were obtained, frequently in two generations (resulting in crossed crystals); fluorine losses were considerable. A 2-chamber furnace with closely controlled temperature distribution was completed in 1949. Charge compositions of ~ 40% quartz, 16 - 29% KF, 18 - 32% MgO, and 11.5 - 22% Al_2O_3 were tried, as well as 71% natural phlogopite with 29% KF, and a mixture corresponding to the calculated formula of phlogopite. Positive results (crystals up to 4 x 2.5 cm) were obtained by placing the crucible in a KF bath. The optimum conditions are: charge composition 41.0 SiO_2 , 25.0 MgO, 14.0 Al_2O_3 , and 20.0% KF; heating to 1400 - 1500°C over 2 - 3 hrs, rapid cooling to 1300 - 1295°C, slow cooling at 3 - 5°/hr to 1200 - 1220°C. Further work is in progress at the Crystallography Institute. There are 3 figures.

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SOV/70-3-1-1/26

AUTHOR: Sheftal', N.N.

TITLE: Yevgeniy Yevgen'yevich Flint (Seventieth Anniversary of His Birth) (K semidesyatiletuyu so dnya rozhdeniya)

PERIODICAL: Kristallografiya, 1958, Vol 3, Nr 1, pp 3-4 (USSR)

ABSTRACT: On October 9 the scientific community celebrated in Moscow the seventieth anniversary of the birth and the 40th anniversary of scientific and teaching work of one of the oldest Soviet crystallographers, Doctor of Geological Sciences, Professor Yevgeniy Yevgen'yevich Flint, who was a pupil of and successor to Yu.V. Vul'f in the department of crystallography of Moscow University. Most of the scientific work of Ye.Ye. Flint was concerned with goniometry (25 papers). He was also concerned with problems of the accuracy of the laws of geometrical crystallography (constancy of angles), design and treatment of crystallographic measurement (stereographic grid) and took part in the compilation of the fundamental "Crystal Locator". Ye.Ye. Flint designed the first Soviet goniometers which are widely used in the Soviet Union. He has compiled a catalogue of pyro- and piezo-crystals which includes almost 1,000 crystals which have or can have piezo- and pyro-properties and a catalogue of hard crystals of natural

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Yevgeniy Yevgen'yevich Flint (Seventieth Anniversary of His Birth)
and artificial substances (120 crystals). Ye.Ye.Flint
has also produced a number of textbooks and monographs
concerned with crystallography. During the last 40 years
more than 10,000 geologists, now practising in the Soviet
Union, have attended the crystallography course which was
given by Professor Flint, who is a holder of the Order of
Lenin. There is 1 figure.

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SHEFTAL' N.N. 25=58=3=26/41

AUTHOR: Sheftal', N.N., Doctor of Geological and Mineralogical Sciences

TITLE: Synthesis of Crystals (Sintez kristallov)

PERIODICAL: Nauka i Zhizn', 1958,²⁵ Nr 3, pp 59-64 (USSR)

ABSTRACT: A detailed description of various well-known methods of synthesizing crystals is given. In this connection, various foreign and Soviet scientists are mentioned, e.g. S.K. Popov, I.V. Stepanov, M.A. Vasil'yeva, F.P. Feofilov, L.M. Belyayev, B.V. Vitovskiy and G.F. Dobrzhanskiy. Academician A.V. Shubnikov laid the foundation in the USSR for research on the synthesis of crystals, the importance of which for industrial purposes is increasing year by year. There are 11 sketches and one illustration.

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Card 1/1 1. Crystals-Synthesis

SHUBNIKOV, A.V., akademik, otv.red.; SHEFTAL', N.N., doktor geol.-min.
nauk, otv.red.; ALEKSANDROV, K.S., red.izd-va; POLYAKOVA,
T.V., tekhn.red.

[Growth of crystals] Rost kristallov. Moskva. Vol.2. 1959.
238 p. (MIRA 12:5)

1. Akademiya nauk SSSR. Institut kristallografii.
(Crystallography)

SHUBNIKOV, A.V., SHEFTAL', N.N.

Foreword. Rost krist. 2:3 '59.
(Crystals—Growth)

(MIRA 13:8)

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30V/70-4-5-36/36

AUTHORS: Slavnova, Ye. N., Shertal', N. N.
TITLE: The Second Conference on Crystal Growth
PERIODICAL: Kristallografiya, 1959, Vol 4, Nr 5, p 804 (USSR)
ABSTRACT: The Second Conference on Crystallography, organized by the Crystallographical Institute of the Academy of Sciences of the USSR (Institute kristallografi AN SSSR) in cooperation with the Scientific Council on Crystal Formation at the Division of Physics and Mathematics of the Academy of Sciences of the USSR (Nauchnyy sov. po probleme "Obrazovaniye Kristallov" pri OFMN AN SSSR), was held in Moscow from March 23 to April 1, 1959. The conference, opened by Academician A. V. Shubnikov and participated in by over 600 scientists, discussed 96 reports, of which 12 were presented by scientists from abroad, from such countries as Czechoslovakia, Hungary, China, Bulgaria, Poland,

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The Second Conference on Crystal Growth

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and East Germany. The subjects included the growth of metal crystals, crystallization in ingots, the growth of phosphors, or optical-, piezo-, and ferroelectric crystals, or semiconductors, silicon, germanium, and of a number of other crystals, hydrothermal synthesis of quartz, carbonates, lead and zinc sulfides, etc. Contemporary scientific concepts of crystal growth were criticized by a number of scientists. R. Kaishev (Bulgaria) outlined the ways along which future theories should advance on the basis of new factors in order to establish theoretical concepts that more accurately reflect the actual processes of crystal growth. The perfection of methods, the development of new production equipment, and new principles of crystal growth were the subjects of a number of other reports. The second volume of the Symposium entitled "Crystal Growth" is scheduled to contain the papers discussing the above topics and the third volume, the reports presented at the Conference. An

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24(2)
AUTHOR:

SOV/30-59-6-27/40
Sheftal', N. N., Doctor of Geological and Mineralogical
Sciences

TITLE:

Investigations of Crystal Growth (Issledovaniya rosta kristallov)

PERIODICAL:

Vestnik Akademii nauk SSSR, 1959, Nr 6, pp 120-121 (USSR)

ABSTRACT:

The Second All-Union Conference on the Growth of Crystals was held in the Institute of Crystallography between March 23 and April 1. More than 600 scientists from 24 cities of the Soviet Union attended this Conference as well as guests from Bulgaria, Hungary, the GDR, China, Poland and Czechoslovakia. 96 reports were delivered, among them 42 by foreign guests and the following discussions were held: on the theories of the crystal growth and the real crystal formation and on the methods of growing monocrystals. The investigations of the molecular-kinetic theory of crystal growth, which is insufficiently dealt with in the USSR, is regarded as interesting for Soviet scientists. In the resolution taken by the Conference it was stated that the extent of the work carried out does not meet the demand of the country. The Conference dealt also with the problem of the training of scientific teams which ought to be considerably intensified in the field of crystal growth in the Institute of

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Investigations of Crystal Growth

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Crystallography. The edition of Soviet and foreign translated publications in this field has to be intensified. An apparatus for the growing of monocrystals from solutions and melts ought to be industrially produced in series. ✓

Card 2/2

KOKORISH, Ye.Yu., SHEFTAL', N.N.

Growth of dislocation-free single crystals of germanium. Kristallografiia 5 no.1:156-157 Ja-F '60. (MIRA 13:7)

1. Institut kristallografii AN SSSR.
(Germanium crystals)

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S/070/60/005/0003/003
E132/E260

5.1150

AUTHORS: Stepanov, I. V., Deceased, Vasil'yeva, M. A., and
Sheftal', N. N.

TITLE: Obtaining Single Crystals From the Melt in Conditions
of Sharply Falling Temperature

PERIODICAL: Kristallografiya, 1960, Vol 5, Nr 2, pp 334-335 (USSR)

ABSTRACT: The authors earlier formulated the problem of growing
large single crystals in the following form: "One of
the most important conditions for the growth of a single
crystal is the strict control of the direction and quantity
of the heat flowing to the crucible from the melt and
from the crystal. The whole thermal system must be
arranged so that the amount of heat supplied at each
element of surface limiting the crystallising mass should
compensate its loss, with a certain small excess, except
at the surface of separation of the crystal and the melt
(the growing surface) which should be the place with the
greatest heat deficit. In such conditions the possibility
of further nucleation is excluded. The regular displace-
ment of the isothermal surface of crystallisation during
the growth of the crystal and the convexity of its form

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Obtaining Single Crystals From the Melt in Conditions of Sharply
Falling Temperature

superheating of the melt and the steep temperature drop
across the growing surface of the crystal.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of
Crystallography, AS USSR)

SUBMITTED: November 25, 1959

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86266

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3019/B056

24.7700 (1043, 1143, 1559)

AUTHORS: . Kokorish, Ye. Yu. and Sheftal', N. N.

TITLE: Dislocations in Semiconductor Crystals

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol. 72, No. 3,
pp. 479 - 494

TEXT: The authors have studied the effect of dislocations upon the electrical properties of semiconductor crystals, the formation of dislocations in growing semiconductor crystals, and the action of dislocations upon semiconductor instruments. In the first part, the lattice distortion caused by dislocations and the change in the forbidden band width connected herewith is discussed. Furthermore, the space charge and the resulting decrease of carrier mobility, as well as the increase of its scattering and the increase of carrier recombination are discussed. The results obtained by non-Soviet scientists concerning the recombination properties of dislocations, which are formed in growing crystals, are discussed, after which the interaction of dislocations with impurity atoms is described. Thus, it is shown that the formation of an impurity

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Dislocations in Semiconductor Crystals

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B019/B056

atmosphere by dislocations leads to a decrease of the effective carrier trapping cross section, and further, the impurity atoms render the shift of dislocations more difficult. Of the methods of visualizing dislocations, the metallographic method, the X-ray method, and the "decoration" method are discussed in detail. For the first-mentioned method, the composition of etching agents for germanium, silicon, Ge-Si alloys and InSb are given in a table, and the etching techniques are discussed. The X-ray method makes it possible to determine the dislocation density without destroying the specimen. The method of "decoration" by precipitation of copper on dislocations, introduced by Dash, and observation in infrared light are described in detail. Five causes for the occurrence of dislocations in growing crystals are discussed in detail: 1) As a consequence of plastic deformation. 2) As a consequence of a disc-shaped accumulation of vacancies in the crystal round the crystallization front, and their subsequent destruction under the formation of a dislocation loop. 3) As a consequence of impurity trapping. 4) As a consequence of the intergrowth of a dislocation from the inoculation. 5) As a consequence of fluctuations of the growth rate. Finally, the results of papers are


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Dislocations in Semiconductor Crystals

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discussed, which deal with the action of dislocations upon the characteristics of semiconductor instruments. It was found that for the production of instruments capable of withstanding a high inverse voltage, semiconductor with the lowest possible dislocation density must be used. There are 6 figures, 2 tables, and 81 references: 12 Soviet, 3 Japanese, 5 German, 2 British, 1 Dutch, 1 Italian, and 53 US.



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A052/A101

24,7100

AUTHORS: Kokorish, N. P., Sheftal', N. N.

TITLE: The morphology of polycrystalline silicon films

PERIODICAL: Referativnyi zhurnal, Metallurgiya, no. 4, 1962, 50, abstract 40329
(V sh. "Rost kristallov. T. 3". Moscow, AN SSSR, 1961, 351 - 356.
Discuss., 501 - 502)

TEXT: The morphology of films along the precipitation zone was studied. This permitted to clarify some special features of the formation of an association of crystals in a directed gas flow and to establish the possibilities of a better utilization of films. The films were produced by passing a mixture of H_2 and Si tetrachloride through a heated quartz tube; whereby Si tetrachloride precipitated in the form of a polycrystalline Si film on the tube and on the graphite bar placed in it. The size of crystallites making up the film precipitated on the bar, as well as the film thickness, varies considerably along the graphite bar. The character and degree of the change depend on the temperature distribution in the reaction space. To produce more uniform films a furnace with a flat temperature gradient was used, since the lower the temperature gradient along the gas flow

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The morphology of...

the longer is the zone and the more uniform is the structure of the film. It is pointed out that the temperature in the crystallization zone is by 570 - 300°C lower than the melting point of Si; therefore, even at a low Si output in the process of reaction, the crystallization out of a highly supersaturated Si vapor takes place. The rate of crystallization is approximately proportional to the film thickness, and the maximum rate of growth of crystals is within 1,020 - 1,060°C.

B. Golovin

[Abstracter's note: Complete translation]

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36556

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A052/A101

24. 7400

AUTHORS: Shestak', N. N., Kokorish, N. P.

TITLE: Mutual growth of silicon and germanium crystals

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 50, abstract 46327
(V sb. "Rost kristallov. T. 3". Moscow, AN SSSR, 1961, 363 - 370.
Discuss., 501 - 502)

TEXT: The epitaxitic growth of Si on Ge and of Ge on Si was investigated experimentally. In both cases at a gradual increase of temperature, transitions from a complete absence of growth to an unoriented growth and then to an oriented broken and an oriented unbroken growth were observed. It has been found that the growth of Si on Ge takes place much easier than of Ge on Si. The explanation of this fact is that the orienting forces of the mother crystal lattice produce in the first case a two-sided tension and in the second case a two-sided compression.

Ye. Givargizov

[Abstracter's note: Complete translation]

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35794
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24.7500

AUTHORS: Kabanish, Ye. Yu., Sheftal', N. N.

TITLE: The problem of growth of dislocationless germanium single crystals

PERIODICAL: Referativnyi zhurnal, Metallurgiya, no. 4, 1962, 48, abstract #0320
(V. sb. "Rost kristallov. T. 3". Moscow, AN SSSR, 1961, 388 - 394.
Discuss., 501 - 502)

TEXT: The effect of some parameters of growing by Chokhralskiy method on the formation of dislocations in Ge single crystals was studied. As initial material polycrystalline Ge ingots, purified by zone melting, with specific resistance of $> 30 \text{ ohm}\cdot\text{cm}$ were used. The diameter of single crystals varied from 5 to 30 mm. The rate of extraction was constant or changed according to the set program from 4 to 0.5 mm/min. The rotating speed of the seed crystal was 50 - 100 rpm, the direction of growing was [111]. The density of dislocations was determined by pickling pits which were detected in the [111] plane, after pickling in potassium ferricyanide solution. It is shown that the density of dislocations in the speed range of 0.5 - 3 mm/min does not depend practically on the rate of extraction and is determined mainly by the cooling conditions of the crystal. At

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On the problem of growth of...

rates of extraction of > 4 mm/min a noticeable increase in the density of dislocations is observed. The effect of the diameter on the density of dislocations was studied at a rate of extraction of 1 mm/min. It is established that with the increase of dimensions of the crystal the density of dislocations increases which is conditioned by considerable difficulties connected with the cooling of large-size crystals. No noticeable effect of Sb, Bi, Ga and In admixtures as well as of a different orientation of seed crystals in $[111]$, $[110]$ and $[100]$ directions on the density of dislocations in the grown crystals was detected. The main part in the formation of dislocations in Ge single crystals play the cooling conditions of the growing crystal from the crystallization temperature to the indoor temperature, and also the perfection degree of the seed crystal. To eliminate considerable temperature gradients in the process of extraction, it is necessary to heat additionally the growing crystal and to cool down very slowly. When a special graphite crucible with a screen was used, the value of the axial temperature gradient on the surface of the crystal was 20 - 40 deg/cm with the resulting decrease of the density of dislocations to 10 cm^{-2} and lower. Dislocationless single crystals were produced at extraction with a seed crystal having no dislocations or with a density lower than 10^3 cm^{-2} . The end of the seed crystal immersed in the smelt had a cone-shaped form. At the beginning a thin crystal was grown. High- and

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In the problem of growth of...

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Low-resistance dislocationless single crystals weighing up to 40 g were produced. Dislocationless crystals as well as crystals with a small density of dislocations had usually higher values of diffusion length than crystals with a density of dislocations of 10^3 cm^{-2} and more. Ge single crystals with a small density of dislocations were produced at zone melting with the temperature gradient of 15°C after the fused zone at its rate of displacement of 2 mm/min. It is established that the dislocations in Ge single crystal arise mainly in the process of its cooling from high temperatures to $< 500^\circ\text{C}$ and as a partial spreading from the seed crystal.

B. Turovskiy

[Abstracter's note: Complete translation]

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B105/B215

AUTHORS: Sheftal', N.N., Doctor of Geological and Mineralogical
Sciences, Sonin, A.S.

TITLE: Scientific Council for the problem of the
"Formation of Crystals"

PERIODICAL: Vestnik Akademii nauk SSSR, no. 3, 1961, 106 - 107

TEXT: Two All-Union Conferences on the growth of crystals are mentioned and it is found that conferences alone do not guarantee progress in the investigation of this field. The Scientific Council therefore decided to supplement these conferences on the problem of the "formation of crystals" by symposia with a restricted number of participants and reports. In 1960, three symposia were held in the Institut kristallografii (Institute of Crystallography) which were attended by representatives of academic institutes, departmental scientific research institutes, and schools of higher education of various cities of the country. The first symposium on metallic single crystals was held from October 24 to 26, 1960. Some problems on the growth of single crystals of perfect structures, and specific

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Scientific Council for the ...

problems on the crystallization kinetics of metallic crystals were discussed. Characteristics of this symposium were the combination of scientific and technological reports and useful discussions at a high theoretical level. The second symposium on piezo- and ferroelectric crystals took place between November 14, and 18, 1960. Problems on the relation between structure and ferroelectric properties were discussed, and also studies on new piezo- and ferroelectric crystals which are of great importance for industrial purposes. The influence of defects on the electrophysical properties of crystals, and problems of growth and some properties of paramagnetic crystals were studied. The third symposium on the growth of semiconducting crystals was held on November 28, and 29, 1960. Reports were given on the most important technological and theoretical problems of growing single crystals, and on new principles of crystal growth. Some basic problems of the technique of growth and the production and examination of new semiconducting compounds were discussed. The participants of the symposium approved of the initiative of the Scientific Council and emphasized the necessity of such systematic meetings of scientists. In future, 10 to 12 symposia annually are planned to be organized by the department of the

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Scientific Council for the ...

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Scientific Councils: one third in the Institute of Crystallography, the second third in other institutes of the capital, and another third outside Moscow.

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S/058/62/000/006/059/136
A061/A101

AUTHORS: Stepanov, I. V., Vasil'yeva, M. A., Sheftal', N. N.

TITLE: The effect of the temperature drop magnitude at the crystal - melt interface on the growth of single crystals. I. Experimental data

PERIODICAL: Referativnyy zhurnal, Fizika, no. 6, 1962, 9, abstract 6E78
(In collection: "Rost kristallov. T. 3". Moscow, AN SSSR, 1961, 239 - 243. Discuss., 501 - 502)

TEXT: Experimental results of an investigation of the optimum thermal conditions of the growth of single crystals from the melt by Tamman's method are presented. An apparatus with a "mobile thermocouple", ensuring the shift of the crystallization isotherm in the furnace and permitting the precise control of temperature and crystal growth rate, is described. However, the quality of the optical single crystals grown in this apparatus is not satisfactory. The Tyndall effect in grown LiF single crystals has been found to be remarkably reduced under conditions of a sharp temperature drop at the crystal - melt interface and of considerable overheating (up to 250 C). It is stated on the strength of experi-

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A061/A101

The effect of the...

ments that the sharp and significant temperature drop at the boundary of the growing crystal, as well as the high temperature of the melt, from which the single crystal is grown, are powerful factors acting very markedly on formation and ensuing crystal properties. ✓

A. Makarevich

[Abstracter's note: Complete translation]

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30539

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D207/D304

24.7000

AUTHORS: Kokorish, N. P., and Sheftal', N. N.
TITLE: Morphology of polycrystalline silicon films
SOURCE: Akademiya nauk SSSR. Institut kristallografii. Rost
kristallov, v. 3, 1961, 351-356
TEXT: This and the two following papers describe the author's work
carried out in 1954 on preparing germanium and silicon films from gas
phase. The present paper deals with the morphology of polycrystalline
silicon films prepared from gas phase by reducing SiCl_4 with H_2 ; the
purpose of the study was to find why electrical properties of these films
are variable. A stream of hydrogen, containing SiCl_4 vapor, was passed
at the rate of 5 cm/sec. through a quartz tube placed in an electrical
resistance furnace. Silicon was deposited in a portion of the quartz
tube and on objects placed in it. To study the mechanism of deposition
of silicon a graphite block of 10 x 15 x 150 mm dimensions was placed

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Morphology of...

inside the quartz tube. The block was somewhat larger than the region where crystallization occurred (this region is known as the crystallization or reaction zone). To make the films more uniform, the temperature gradient in the quartz tube was small. The temperature distribution (T) in the crystallization zone, the variation of the film thickness (A) along the graphite block, and the mean magnitude of crystallites (S) of which the film was composed are all given. It was found that the film was very thin at the beginning of the crystallization zone, where it consisted of a very large number of small grains. Both the film thickness and the magnitude of single grains increased along the crystallization zone in the direction of gas flow. Towards the end of the crystallization zone, the mean size of grains still increased, but the film became discontinuous. Finally, at the end of the zone, single or small groups of large crystallites (up to 200 μ in size) were found instead of the film. Sections of the film at right angles to gas flow showed that at the beginning of the crystallization zone the film consisted of several layers of fine grains. In the middle of the crystallization zone, the number of these layers decreased. Towards the end of the zone, the film consisted

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Morphology of...

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S/564/61/003/000/010/029
D207/D304

of a single layer. The results obtained are discussed in terms of nucleation and of crystal growth velocities. It is concluded that portions of the films formed in the middle of the crystallization zone are suitable for electrical applications because of their single-layer (effectively monocrystalline) structure. Elsewhere, the films are either amorphous or fine-grained with intergrain layers (at the beginning of the crystallization zone) or are discontinuous (at the end of the zone). Unidirectional laminar flow of gas tends to produce films whose properties vary along their length in the crystallization zone. There are 7 figures and 4 references: 2 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: R. P. Ruth, I. C. Marinace and W. C. Dunlap, J. Appl. Phys., 31, 6, 995-1006, 1960; I. B. M. Journal, no. 3, 1960.

X

Card 3/3

30541

S/564/61/003/000/012/029
D228/D304

18.950

AUTHORS: Sheftal', N. N., and Kokorish, N. P.

TITLE: Reciprocal grafting of crystals of silicon and germanium

SOURCE: Akademiya nauk SSSR. Institut kristallografii. Rost kristallov, v. 3, 1961, 363-370

TEXT: This work is a continuation of previous research by N. P. Kokorish (Ref. 6: Sb. Rost kristallov, v. 2, Izd. AN SSSR, 1959, 132-139) on the epitaxial grafting of Si and Ge crystals. The theory of epitaxial grafting was developed by P. D. Dankov (Ref. 3: Trud. 2-y konferentsii po voprosam korrozii, 11, 121, 1943) and later perfected by G. M. Bliznakov (Ref. 4: Godishn. na Sof. univ. Fiz. khim. fak., kn. 2. Khimiya, ch. I, II, 65-71, 1956); P. S. Vadilo (Ref. 2: Uchen, zap. Kurskogo gos. inst., 4, 143, 1957) and L. E. Collins et al have studied other aspects of this problem—the grafting of alkali-halide crystals on mica and the growth of Ge crystals on halite. Experimental procedure.

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S/564/61/003/000/012/029
D228/D304

Reciprocal grafting of...

Etched crystals of Ge and Si, cut along three planes, are respectively coated with films of crystalline Si and Ge by the method of N. N. Sheftal' et al (Ref. 8: Izv. AN SSSR, ser. fiz., 21, no. 1, 146-152, 1957)—the reduction of the corresponding chloride by hydrogen. (a) Grafting of Ge on Si: A 30 μ -thick layer of Ge, largely consisting of un-oriented semicrystalline aggregates, precipitates at 800°C; oriented crystals appear at 840°C on (100), (110) and (111) surfaces, but the coating is patchy and peels off at higher temperatures. (b) Grafting of Si on Ge: A semicrystalline layer is deposited below 900°C; close to the melting-point of Ge (937.2°C) an oriented crystalline layer is formed with a thickness of up to 30 μ ; the coating is durable and has an n-type conductivity. The increase in the temperature—and the consequent decrease in the supersaturation—is believed to be responsible for the successive formation of hemi- and holo-crystalline growths. The absence of any Ge precipitate on Si above 900°C, however, may be due to the decrease in the size of the Ge particles separating out in the gas stream; their deposition is thus impeded, and they are removed from the crystallization sphere in the gas stream. The grafting of Ge crystals probably

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Reciprocal grafting of...

requires a weaker degree of supersaturation than was achieved in these experiments. The greater ease with which Si accumulates on Ge results from the operation of bilateral tension—as compared with bilateral compression in the case of Ge grafting—on the accretive layer by the parent crystal's orienting forces, and so the growth of Si shifts to the region of its higher supersaturation. In conclusion, the authors stress the need to perfect the crystallization method so that a homogeneous and continuous coating of Ge may be obtained on Si. There are 7 figures and 9 references: 6 Soviet-bloc and 3 non-Soviet-bloc. The references to the English-language publications read as follows: L. E. Collins et al, Proc. Phys. Soc., B, 65, 10, 394, 825 (1952); F. X. Hassion et al, J. Phys. Chem., 59, 1076, 1955. X

Card 3/3

187530 1145
9.4300 (and 1035, 1143)

20109

S: 8/6/003/002/007/050
B: 02/B204

AUTHORS: Kurov, G. A., Sheftal, N. N., and Kokorish, N. P.

TITLE: Investigation of coarse-crystalline germanium layers obtained by pyrolysis from the gaseous phase

PERIODICAL: Fizika tverdogo tela, v. 3, no. 2, 1961, 370-372

TEXT: Thin, fine-crystalline germanium layers are characterized by a very low resistivity, and have usually p-type conductivity. According to published data, germanium layers with crystals of $\approx 5 - 10 \mu$ and more, should depend on the size of the crystals and on the impurities with respect to their properties. In order to check this, the authors investigated the electric properties of $10 - 50 \mu$ thick germanium layers, which had been vaporized on quartz backings, by means of the so-called hydrogen method. Hydrogen was conducted over liquid GeCl_4 and later into a quartz tube heated to $700 - 900^\circ\text{C}$; the reaction $\text{GeCl}_4 + 2\text{H}_2 \rightarrow \text{Ge} + 4\text{HCl}$ took place. The excess of hydrogen, the hydrogen chloride, and small quantities of Ge and GeCl_4 were drained off into the atmosphere, the main Card 1/4

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S/81/61/003/002/007/050
B102/B204

Investigation of coarse crystalline

part of the germanium crystallized on quartz. Besides quartz, also polished graphite backings were used. All backings were previously subjected to vacuum heat treatment. In the case of crystallization times of from 20 minutes to 1 hr. layer thicknesses of $3-5\mu$ and up to 50μ were produced. The $GeCl_4$ used was spectrally pure. The structure of the

crystallization zones was non-uniform. At the beginning of the zone the crystals were not larger than $\approx 0.1\mu$. In the middle part $5-10\mu$, and at the end of the zone they were $40-50\mu$, several crystals attained up to 200μ . It was found that the resistivity of germanium increases exponentially with increasing size of the crystallites. The layers crystallized onto graphite showed a dependence of the kind of conductivity on the size of the crystallites. Crystallites of the size of 0.1μ were of p-type conductivity; at $3-5\mu$ the thermo emf passed from positive to negative values, and the coarse-crystalline layer, beginning with $3-5\mu$, had n-type conductivity (at room temperature). The layer structure on graphite was equal to that on quartz, with the exception that the germanium crystals on quartz, independent of the size of the crystallites, showed p-type conductivity. Layers of thickness $10-20\mu$ had a resistivity of $\rho = 28-35$ ohm cm, which is by three orders of magnitude higher

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S: 8/6/003/002/007/050
B102/B204

Investigation of coarse crystalline

than that of the fine-crystalline layers. Heating of 2-3 hr at 500-600°C diminished the resistivity of these layers to 25 ohm-cm. Experiments were also made in order to alloy the germanium layers formed with impurities. For this purpose, spectrally pure phosphorus chloride (donor) and borobromide (acceptor) were used. The introduction of phosphorus was followed by the occurrence of n-type conductivity, which was in all cases independent of the size of the crystallites; boron was analogously followed by p-type conductivity. Both kinds of impurity decreased the resistivity of the coarse-crystalline layer to 5-6 ohm-cm. The effect produced by impurities upon the kind of conductivity was exactly the same as in the case of macroscopic monocrystals. The results of the investigations show agreement with the assumptions made in Ref. 6 concerning the pyrolysis of germanium layers. The difference in crystallite size in the crystallization zone is explained by the fact that in the mixture of HCl-H₂ and germanium vapor the crystallization centers accompany the flow, depart whereby the number of remaining crystals is reduced and, consequently, increased in size. That is why, at the beginning of the crystallization zone, small crystals occurred, which were

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20109

Investigation of order-crystalline .

5 18 61 003-002 007 050
B-02, B204

followed by larger and larger ones G. I. Spiridonova took part in the
measurements. There are 3 figures and 7 references: 4 Soviet-bloc and
3 non-Soviet-bloc. *

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallo-
graphy, U.S. USSR)

SUBMITTED: April 21, 1960

Card 4/4

189500

30543

S/564/61/003/000/015/029
D207/D304

AUTHORS: Kokorish, Ye. Yu., and Sheftal', N. N.

TITLE: On the problem of growing germanium monocrystals free of dislocations

SOURCE: Akademiya nauk SSSR. Institut kristallografii. Rost kristallov, v. 3, 1961, 388-394

TEXT: The authors describe experiments carried out in 1957-58 on preparing germanium monocrystals free of dislocations. The purpose of the work was to obtain material from which better semiconductor devices could be made. A brief discussion of how dislocations are formed is followed by details of experimental procedure. Polycrystalline ingots of zone-purified germanium of > 30 ohm.cm resistivity were used as the raw material. Monocrystals were grown by Czochralski's technique of pulling from the melt in a hydrogen atmosphere. The rate of pulling was varied from 0.5 to 4 mm/min. A seed crystal was rotated at 50 - 100 rpm. X

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S/564/61/003/000/015/029
D207/D304

On the problem of...

The melt was contained in an electrically-heated graphite crucible. Monocrystals were grown mainly along the $[111]$ direction. Dislocation densities were found by etching (111) faces in a potassium ferricyanide solution. It was found that the density of dislocations was least in the middle portions of grown monocrystals. Increase in the rate of pulling, especially above 4 mm/min., and increase of the transverse cross-section of grown monocrystals both increased the dislocation density. The crystallographic orientation of a seed crystal did not greatly affect the number of dislocations. Dislocations were formed by thermal stresses (thermal shock and steep temperature gradients) which were produced by rapid cooling; another mechanism of dislocation formation was by growth of dislocations from the seed crystal. Using the knowledge gained in these experiments, the authors were able to grow pure and Sb- or Ga-doped germanium monocrystals which were practically free of dislocations (10 cm^{-2} or less). Acknowledgments are made to V. K. Bichev and E. V. Myakinenkova for their help in experiments. There are 6 figures, 2 tables and 15 references: 3 Soviet-bloc and 12 non-Soviet-bloc. The 4

Card 2/3

30543

S/564/61/003/000/015/029
D207/D304

On the problem of...

most recent references to the English-language publications read as follows: W. C. Dash, J. Appl. Phys., 29, 736, 1958; P. Penning, Philips Res. Repts, 13, 79, 1958; F. D. Rosi, RCA Rev., 19, 349, 1958; J. G. Gressel, J. A. Powell, Progress in Semiconductors, II, 137, London, 1957.

X

Card 3/3

S/C58/62/000/004/C95/160
AC61/A101

AUTHOR: Sheftal', N. N.

TITLE: Problem of real crystal formation. II

PERIODICAL: Referativnyy zhurnal, Fizika, no. 4, 1962, 11, abstract #E91 (Sb.
"Rost kristallov. T. 3". Moscow, AN SSSR, 1961, 9-21. Discuss.
214-218)

TEXT: Problems of crystal formation are considered. It is noted that the relationship between the homogeneity of the internal structure and the simplicity of the external crystal shape is more complicated than had formerly been supposed. The importance of the perfect seed crystal in the production of high-quality crystals is shown. The effect of the ambient temperature on the crystal shape is considered. The entering of impurities into the growing crystal and the rôle of crystallization pressure in self-purification process are thoroughly investigated. The conclusion which is important for the breeding practice is, that a maximum self-purification effect is necessarily observed when the crystallization isotherm has a flat shape, and when this isotherm corresponds to faces of the equilibrium shape. An experimental test showed this conclusion to be correct.

Card 1/2

Problem of real crystal formation. II

3/058/62/000/004/095/160
A061/A101

It is noted that the conditions of formation of the most perfect crystals should be those found in crystallization from the gaseous phase. There are 29 references. Part I see RZhFiz. 1958, no. 4, 8331. ✓

Ye. Givargizov

[Abstracter's note: Complete translation]

Card 2/2

38179

S/058/62/000/004/100/160
A061/A101

26.2421

AUTHORS: Kokorish, Ye. Yu., Sheftal', N. N.

TITLE: Problem of the growth of dislocation-free germanium single crystals

PERIODICAL: Referativnyy zhurnal, Fizika, no. 4, 1962, 26, abstract 4E230
(V sb. "Rost kristallov. T. 3". Moscow, AN SSSR, 1961, 388-394,
Discuss., 501-502)

TEXT: It is shown that the density of dislocations in Ge single crystals grown from a melt in the usual manner is minimum in their central part. The effect of the rate of growth, of the crystal transverse dimensions and of the seed crystal orientation along (111), (110), and (100) on the formation of dislocations in Ge single crystals was investigated. Dislocations were chiefly found in Ge single crystals cooled from high temperatures to below 500°C. Thermal shock and high temperature gradients in the crystal were found to be the main causes of the formation of dislocations. Dislocation-free Ge single crystals, both high-ohmic and low-ohmic, alloyed with Sb or Ga were obtained.

[Abstracter's note: Complete translation]

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L 18450-63 EWP(q)/EWT(1)/EWT(m)/BDS AFFTC/ASD/ESD-3/IJP(C) JT/JD/JG
ACCESSION NR: AT3001891 S/2912/62/000/000/0009/0010

AUTHOR : Sheftal', N.N., Deputy Chairman, Scientific Council on the Problem
of "Formation of Crystals "

TITLE: Statement of the Scientific Council on the Problem of "Formation of
Crystals."

SOURCE: Kristallizatsiya i fazovy*ye perekhody*. Minsk, Izd-vo AN BSSR, 1962, 9-10.

TOPIC TAGS: crystal, crystallization, crystallography, growth, formation,
growing, monocrystal, single crystal, single

ABSTRACT: Soviet science must occupy a leading world position both in the theory
and in the practice of the growing of crystals. We need, according to A. V. Shubni-
kov's expression, a theory that can help us to grow more single crystals. Thus
far only first steps have been made. The Minsk meeting has brought together
theoretical investigators of both the older and the younger generation, theoreticians
as well as experimenters. Theoretical clarifications set forth there should urge
the experimenters on to perform more and more accurate experiments that will
provide dependable material for the development of further advanced theoretical
concepts. The Scientific Council hopes that this meeting will lead to systematic

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L 18450-63

ACCESSION NR: AT3001891

4

and possibly annual meetings on the theory of the growth of crystals, as well as to symposia on more specialized theoretical problems. We propose Minsk as the annual meeting place. Five years ago the Institute of Crystallography held a meeting on the growing of crystals which, we believe, was extremely productive. This work has now been continued by the Scientific Council on the Problem "Formation of Crystals." We now stand on the threshold of a third phase. The State Council for the Coordination of Scientific Work has meanwhile been founded. The Academy of Sciences, USSR, has been entrusted with the guidance of a number of problems. Our problem, one of the aspects of the greater problem of solid-state physics, lies within that scope. Closer coordination and unity in work on this problem will no doubt result from this step. We must hope that all of this will help the development and theoretical advances in the sector of the formation of crystals. Orig. art. has no tables, figures, or formulas.

ASSOCIATION: Nauchnyy sovet po probleme "Obrazovaniy kristaliov" (Scientific Council on the Problem of "Formation of Crystals")

SUBMITTED: none

DATE ACQ: 16Apr63

ENCL: 00

SUB CODE: CH, PH, MA

NO REF SOV: 000

OTHER: 000

Card 2/2

GIVARGIZOV, Ye.I.; SHEFTAL', N.N.

Decorating of a growing crystal surface. Dokl. AN SSSR 150 no. 4:
85-88 My '63. (MIRA 16:6)

1. Institut kristallografii AN SSSR. Predstavleno akademikom N.V.
Belovym.

(Crystals—Growth)

SHEFTAL', N.N., doktor geologo-mineralog.nauk

Growing of single crystals and technical progress (to be continued).
Priroda 53 no.3:19-26 '64. (MIRA 17:4)

1. Institut kristallografii AN SSSR, Moskva.

SHEFTAL', N.N., doktor geologo-mineralogicheskikh nauk;
SLAVNOVA, Ye.N.

Exchange of experience gained in studies on crystal growth.
Rost krist. 4:245-246 '64. (MIRA 17:8)

1. Otvetstvennyy redaktor sbornika "Rost kristallov" (for
Sheftal').

SHEFTAL', N.N., doktor geologo-mineralogicheskikh nauk

Determination of symmetry. Rost krist. 4:222-229 '64.

Physical meaning of symmetry. Ibid.:230-244 '64.
(MIRA 17:8)

1. Otvetsstvennyy redaktor sbornika "Rost kristallov".

SHEFTAL', N.N., doktor geol.-mineral.nauk

Growing of single crystals and the technological progress. Priroda 53
no.4:42-52 '64. (MIRA 17:4)

1. Institut kristallografii AN SSSR, Moskva.

SHEFTAL', N.N., doktor geologo-mineralogicheskikh nauk;
GAVRILOVA, I.V.

Equilibrium shape of crystals allowing for volume free energy.
Rost krist. 4:32-35 '64. (MIRA 17:8)

1. Otvetstvennyy redaktor sbornika "Rost kristallov" for
Sheftal').

S/2564/64/004/000/0015/0021

ACCESSION NR: AT4040551

AUTHOR: Sheftal', N. N.; Givargizov, Ye. I.; Spitsy*n, B. V.; Kevorkov, A. M.

TITLE: Growth of epitaxial germanium films f20n supercooled droplets

SOURCE: AN SSSR. Institut kristallografii. Rost kristallov, v. 4, 1964, 15-21

TOPIC TAGS: germanium, germanium crystal, crystal growth, germanium film, epitaxial film, epitaxial germanium film, supercooled droplet, germanium monocrystal, gas phase crystallization, germanium tetrachloride, crystallography

ABSTRACT: In a study of the peculiarities of "high-temperature" crystallization of germanium from the gaseous phase during reduction of GeCl_4 by hydrogen, (111), (110) and (100)-oriented monocrystalline germanium plates were ground, chemically polished (HF and HNO_3), washed with deionized water and dried. After preheating in a flow of dry hydrogen at 870°C to remove surface oxides, the plates were grown for about 10-20 min. at $740-870^\circ\text{C}$ in the apparatus previously described. The new 5-10 micron layer was then examined with an optical and electron microscope. These examinations showed that the crystal growth resulted from deposition of very small droplets of supercooled germanium on the surface. The

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ACCESSION NR: AT4040551

phenomenon is discussed in detail and is given a theoretical explanation. An energy diagram characterizing the transformation is plotted which shows the two possible transformation patterns: (1) formation of free germanium atoms from the chemical compound with their subsequent condensation, and (2) decomposition of molecules of the initial compound directly on the surface of the condensed phase. "The authors extend their gratitude to Candidate in the Physical-Mathematical Sciences S. A. Semiletov for preparing the electronogram, and to M. V. Gavrilova for the electron-microphotographs." Orig. art. has: 8 figures.

ASSOCIATION: Institut kristallografii, AN SSSR (Institute of Crystallography, AN SSSR)

SUBMITTED: 00

DATE ACQ: 02Jul64

ENCL: 00

SUB CODE: IC, EC

NO REF SOV: 004

OTHER: 003

Card 2/2

L 8886-65 EWT(m)/EWP(q)/EWP(b) IJP(c)/AS(mp)-2/ESD(dp)/ESD(gs)/SSD/ESD(t)/
 RAEM(a)/ASD(a)-5/AFWL/RAEM(c) JD
 ACCESSION NR: AP4046046 S/0070/64/009/005/0686/0689

AUTHORS: Sheftal', N. N.; Givargizov, Ye. I.

TITLE: Dependence of the rate of growth of single crystal layers of germanium on the orientation of the substrate and on the conditions of crystallization in the gaseous phase

SOURCE: Kristallografiya, v. 9, no. 5, 1964, 686-689

TOPIC TAGS: crystal growth, single crystal, germanium, thin film, crystallization

ABSTRACT: The rate of growth of single-crystal germanium layers on substrates parallel to the (111), (110), and (100) faces was investigated as a function of the conditions of the crystallization due to the decomposition of GeCl_4 in a stream of hydrogen. The crystallization setup was described earlier (Givargizov, Fiz. tv. tela, v. 5, 1150, 1963). The experiments were carried at 650--720C. The

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ACCESSION NR: AP4046046

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morphology of the grown crystals was investigated in parallel with the measurements of the growth rate. Plots were obtained for the dependence of the rate of crystal growth on the partial pressure of the GeCl_4 vapor in the initial mixture at fixed values of the substrate temperature and of gas flow. Plots were also obtained for the dependence of the rate of growth of the Ge crystal on the partial pressure of the GeCl_4 vapor in the initial mixture at several temperatures. The growth rate was found to depend on the substrate orientation, with the (111) orientation being quite different from the (110) and (100) orientations. This difference in the behavior of the substrates is attributed to a difference in the number of first-, second-, and third-order nearest neighbors. "The authors thank A. N. Stepanova, A. M. Kevorkov, and L. N. Obolenskaya for help with the experimental work." Orig. art. has: 3 figures.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography AN SSSR)

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L 8886-65

ACCESSION NR: AP4046046

SUBMITTED: 31Jan64

ENCL: 00

SUB CODE: SS

NR REF SOV: 004

OTHER: 003

Card 3/3

L 19641-65 EEC(b)-2/EWT(1)/EWT(m)/EWP(b)/T/EWP(t) IJP(c)/RAEM(a)/AFWL/ASD(a)-5/
ACCESSION NR: AP5000292 SSD/ESD(dp)/ESD(t)/0070/64/009/006/0902/0909

GG/JD

AUTHOR: Magomedov, Kh. A.; Sheftal', N. N.

TITLE: Growth mechanism of gallium arsenide epitaxial layers 27 27 218 B

SOURCE: Kristallografiya, v. 9, no. 6, 1964, 902-909

TOPIC TAGS: gallium arsenide semiconductor, epitaxial film, single crystal film, polycrystalline film, epitaxial growth, chemical transport reaction, epitaxial film morphology

ABSTRACT: The epitaxial deposition rate of GaAs and growth habits of GaAs thin films on a GaAs single-crystal substrate have been studied in a vertical open-tube system. The epitaxial deposition was carried out by the chemical transport reaction using iodine vapors. The study was prompted by the increasing application of GaAs epitaxial films in the construction of solid-state devices (transistors, diodes, tunnel diodes, electroluminescent lamps, lasers). The effect of variable growth parameters — temperature of the substrate and the source, iodine partial pressure, carrier-gas (hydrogen) flow rate — were studied to clarify the mechanism of the growth of GaAs thin films.

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ACCESSION NR: AP5000292

Experiments were carried out in a three-zone furnace with individual temperature control in each zone. The source (in zone 2) was n-type GaAs single crystals. The substrate (in zone 3) was chemically etched, weighed, and gas etched in an iodine vapor stream. The epitaxial films had the same conductivity type and resistivity as the source. Microinterferometric, micrographic, and electronographic investigations indicated that the deposition rate and morphology of epitaxial films on (111) A and (111) B planes depend mainly on substrate temperature (in the 550—700C range), iodine partial pressure (in the 0.7—8.2 mm Hg range), and hydrogen flow rate near the source (in the 5—30 cm/sec range). Optimum conditions were established for a single-crystal deposit on the (111) plane, without geometrical surface patterns. Polycrystalline layers were observed on both planes of the substrate at certain temperatures and at iodine partial pressure. Various geometrical patterns including twins were always present on (111) B surfaces. The maximum deposition rate was 90 μ /hr — on the (111) A plane. Orig. art. has: 8 figures and 2 formulas.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography, AN SSSR)

Card 2/3

L 19641-65

ACCESSION NR: AP5000292

SUBMITTED: 09Jun64

ENCL: 00

SUB CODE: SS

NO REF SOV: 002

OTHER: 015

ATD PRESS: 3158

Card 3/3

L 16575-65 EWT(m)/EWP(t)/EWP(b) ESD(t)/RAEM(c)/ESD(gs)/SSD/AFWL/ASD(a)-5/
AS(mp)-2/IJP(c) JD S/0070/64/009/006/0933/0937

ACCESSION NR: AP5000299

AUTHORS: Givargizov, Ye. I.; Sheftal', N. N.

TITLE: On different forms of stacking faults in grown layers of germanium

SOURCE: Kristallografiya, v. 9, no. 6, 1964, 933-937

TOPIC TAGS: germanium, crystal growth, stacking fault, crystal lattice defect

ABSTRACT: The authors investigated experimentally the laws governing the formation of different types of defects in germanium layers with orientations (111) and (100), grown by reduction of germanium tetrachloride in a stream of hydrogen. The investigations were made in a dark field of a metallographic microscope with interference contrast. The variation of the shape of the defects with depth of the grown layer was investigated by successive etching. A cer-

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ACCESSION NR: AP5000299

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tain regularity was observed in the appearance of some of the defects, especially "single" lines, namely that when the orientation of the layer deviates from that of the ideal (111) plane the lines are always parallel to the shortest sides of the original triangular defect. A method of checking on this regularity is briefly described. Other stacking faults and jogs are discussed. "The authors thank V. I. Muratova and L. N. Obolenskaya for help with the experiments." Orig. art. has: 8 figures.

ASSOCIATION: Institut kristallografii AN SSSR (Institute of Crystallography AN SSSR)

SUBMITTED: 15Apr64

ENCL: 00

SUB CODE: SS

NR REF SOV: 002

OTHER: 006

Card 2/2

SHEFTAL', N.N., doktor geol.-miner. nauk, red.; ALEKSEYEV, V.A.,
red.

[Crystallization from the gaseous phase] Kristallizatsiia
iz gazovoi fazy. Moskva, Izd-vo "Mir," 1965. 344 p.
(MIRA 18:5)

L 54838-65 EWT(1)/EWT(m)/EWP(i)/EPF(n)-2/EPR/T/EWP(t)/EEC(b)-2/EWP(b)/EWA(c) Ps-4

ACCESSION NR: AP5015019 Pi-L/Pu-L IJP(c) JD/WW/JG/OG
UR/0078/65/010/006/1510/1510

AUTHOR: Sheftal', N. N.; Corbunova, K. M.

TITLE: Problems of the growth and preparation of single crystals, Third Conference on crystal growth

SOURCE: Zhurnal neorganicheskoy khimii, v. 10, no. 6, 1965, 1510

TOPIC TAGS: solid state physics conference, crystal, crystal growth

ABSTRACT: The Third Conference on Crystal Growth was held in November 1963 in Moscow. About 800 Soviet-bloc scientists presented 150 papers which will be published in 1965 as Volumes 5 and 6 of the collection *Rost Kristallov*. (Crystal Growth) Volume 5, entitled *Growth and perfection of single crystals; the crystallization medium*, contains papers on the theory of crystal growth, the mechanism of the formation of single crystals, epitaxial growth, liquid state, liquid crystals, the effects of temperature, pH, and radiation on the morphology and homogeneity of crystals, and studies of the degree of crystal perfection by various physical methods. The names of the authors are given. Volume 6, entitled *Ways of preparing ideal single crystals*, includes

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L 54838-65

ACCESSION NR: AP5015019

such topics as hydrothermal synthesis of fibrous silicates²⁷, aluminates²⁸, and zinco-silicates of sodium²⁷; growing the single crystals of barium titanate, yttrium aluminosilicate, rare earth silicates and aluminates²⁷, and refractory compounds from fluxed melts; growing alkali halide and metallic crystals from melts for nuclear technology; growing ferrites and large corundum single crystals by the Verneuil technique; growing semiconductor germanium²⁷ and silicon carbide crystals; and epitaxial growth of thin films, nonepitaxial growth of monocrystalline thin films, and dendrites. ¹⁸

ASSOCIATION: none

SUBMITTED: 00

NO REF SOV: 000

ENCL: 00

OTHER: 000

SUB CODE: SS

ATD PRESS: 4021-F

Card 2/2

L 15205-66 EWT(m)/T/EWP(t)/EWP(b) LJP(c) JD/JG

ACC NR: AP6001227

(A) SOURCE CODE: UR/0363/65/001/012/2113/2119

AUTHOR: Magomedov, Kh. A.; Sheftal', N.N.

ORG: Institute of Crystallography, Academy of Sciences SSSR (Institut kristallografi Akademii nauk SSSR)

TITLE: Mechanism of growth and defects of epitaxial gallium arsenide films

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 12, 1965, 2113-2119

TOPIC TAGS: epitaxial growing, gallium arsenide, crystal defect

ABSTRACT: The effect of mainly two factors, the crystallization temperature in the 550 — 850C temperature range and partial pressure of iodine in the 0.6 — 8 mm Hg pressure range, on the perfection of GaAs epitaxial films was investigated. At 640 — 650C packing defects in the form of equilateral triangles, isosceles trapezoids, and single lines are formed on surface A (111). Sometimes growth pits also appear. At higher temperatures of the deposition zone (700 — 850C), only growth pits in the form of trigonal, ditrigonal, hexagonal truncated, and complete pyramids are formed. The formation of stacking faults and growth pits is due to the presence of oxide islets of $\beta\text{-Ga}_2\text{O}_3$ on the substrates. No growth pits or stacking faults are formed on surface B (111), but penetration twins appear at low temperatures (640C) and truncated and complete pyramids are formed at 700 — 750C. When the GaAs source is at 1000C and the substrates at 640C, the iodine partial pressure is 2.26×10^{-3} mm Hg and the

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UDC: 546.681'191

L 15205-66

ACC NR: AP6001227

flow rate is 5 cm/sec, no growth figures whatever form on surface A (111) if the surface of the substrate is subjected to annealing and gas etching prior to the growing. Authors thank Yu. N. Yarmukhamedov for assistance in the microscopic study and in obtaining photomicrographs of the film. Orig. art. has: 5 figures and 1 formula.

SUB CODE: 11, 20 / SUBM DATE: 31May65 / ORIG REF: 002 / OTH REF: 016

TS
Card

2/2

L 15968-66 EWT(m)/T/EWP(t)/EWP(b) IJP(c) JD/JG

ACC NR: AT6002273

(A) SOURCE CODE: UR/2564/65/006/000/0388/0392

AUTHOR: Magomedov, Kh. A.; Sheftal', N.N.

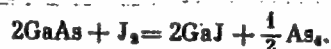
ORG: none

TITLE: Growing of epitaxial gallium arsenide films. (Paper presented at the Third Conference on Crystal Growing held in Moscow from 18 to 25 November, 1963.)

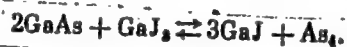
SOURCE: AN SSSR. Institut kristallografii. Rost kristallov, v. 6, 1965, 388-392

TOPIC TAGS: epitaxial growing, gallium arsenide

ABSTRACT: The article describes the apparatus and method developed for preparing epitaxial gallium arsenide films by the open hydrogen-iodide method. In this method, a stream of hydrogen carries iodine vapor, which encounters gallium arsenide in the high-temperature zone and reacts as follows:



The reaction products are carried to a cooler zone, where the second reaction occurs on the surface of a substrate:



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ACC NR: AT6002273

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The constructed device makes it possible to reproduce the experimental conditions more accurately, to carry out the process under conditions close to equilibrium, and to produce and maintain in the working volume the required temperature profile and other parameters of the process. The device was used to prepare single-crystal epitaxial gallium arsenide films grown on single-crystal gallium arsenide and germanium substrates. It is also suitable for preparing epitaxial films of silicon, germanium, and other semiconducting materials. Authors thank V.F. Martynov for his high-quality glass-blowing work. Orig. art. has: 1 figure.

SUB CODE: 20, 07 / SUBM DATE: none / ORIG REF: 001 / OTH REF: 003

bvk

Card 2/2

SHEFTALI, R.N.; TAIAN, DOVA, L.I.

Electron diffraction study of amorphous In_2O_3 . Kristallografiia
10 no.2:205-208 Mr-Apr '65. (MIRA 13:7)

1. Institut kristallografii AN SSSR.

L 12032-66 EWP(e)/EWT(m)/EWP(t)/EWP(b) IJP(c) JD/WH

ACC NR: AF5021671

SOURCE CODE: UR/0030/65/038/008/1863/1866

AUTHOR: Ryabova, L. A.; Savitskaya, Ya. A.; Sheftal', R. H.

ORG: none

Title: Production and structure of indium oxide films 4

SOURCE: Zhurnal prikladnoy khimii, v. 38, no. 8, 1965, 1863-1866

TOPIC TAGS: metal film, indium compound, crystal structure, tantalum, nickel, quartz, molybdenum glass, ~~thermal decomposition~~, dielectric layer, electron diffraction, ~~electric resistance~~

ABSTRACT: T-In (0.06 - 1 μ) In_2O_3 films were produced on various substrates (tantalum, nickel, quartz, and molybdenum glass) by thermal decomposition of $(\text{C}_2\text{H}_5\text{O}_2)_3\text{In}$ -vapor. The dielectric layers of In_2O_3 had a resistivity of $\sim 10^{12}$ ohm cm. This was much higher than the resistivity of the In_2O_3 films ($10^3 - 10^6$ ohm cm) obtained by other methods: vaporization of In in a vacuum with subsequent oxidation, or by hydrolysis of chlorides. The temperature of film formation depended on the composition of the substrate. It was 300C on quartz and glass, 400C on nickel, and 650C on tantalum. The 300C temperature was also optimum for the formation of

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UDC: 539.23

103
97
B

L 12032-66

ACC NR: AP5021671

high-resistivity films ($10^{10} - 10^{12}$ ohm cm) on quartz and glass. Films with lower resistivity were formed on corresponding substrates at temperatures higher than indicated above. Electron diffraction phase analysis showed that the production of high-resistivity films was related to changes in the film structure affected by the temperature. The films deposited on quartz at 380C and on glass at 350C had an amorphous structure (blurred rings in the electron diffraction picture) and high resistivity. The films, formed on glass at 400C had more distinct rings in their electron diffraction pictures. This indicated a greater ordering of the structure, which evidently affected the decrease in resistivity. Films of the required resistivity could thus be produced by selection of the proper deposition temperature. However, there was a threshold temperature above which the films became contaminated with carbon, liberated by the decomposition of reaction products. For the quartz substrate this temperature was 500C and for tantalum, 750C. The termination of film formation could be determined by the observation of its resistivity without visual examination. The author thanks L.A. Zernova and V.U. Antokhina for assistance during the experiments. Orig. art. has: 3 figures and 1 table.

SUB CODE: 11, 2c/ SUBM DATE: 25May64/ ORIG. REF: 002/ OTH. REF: 004

ACC NR: AP6027249

SOURCE CODE: UR/0109/66/011/008/1536/1537

AUTHOR: Zhdan, A. G.; Sheftal', R. N.; Chugunova, M. Ye.; Yelinson, M. I.

ORG: none

TITLE: Properties of cadmium-sulfide films produced by vacuum-spraying onto directive backings

SOURCE: Radiotekhnika i elektronika, v. 11, no. 8, 1966, 1536-1537

TOPIC TAGS: microelectronic thin film, cadmium sulfide

ABSTRACT: C. A. Escoffery did not obtain high-quality single-crystal CdS films apparently because of nonoptimal experimental conditions (Solid State Electronics, 1963, 7, 1, 31). The present article reports the successful preparation and testing of CdS films sprayed onto muscovite, flogopite, NaCl, KCl, and α - Al_2O_3 ; R. Zuleeg's method of spraying was used (Solid State Electronics, 1963, 7, 1, 31).

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UDC: 539.216.22:546.48'22

PROCESSES AND PROPERTIES INDEX

22

Energy Sources in Metallurgical Plants in South Russia. A. Sheftel
(Izvest. 1934, (23), 15-22). - S. G.

OPEN MATERIALS INDEX

CLOSED MATERIALS INDEX

ASR-SLA METALLURGICAL LITERATURE CLASSIFICATION

FROM 000177

FROM 000177

USSR/Engineering
Fuel Conservation
Fuel Consumption

Sep 1947

"Ways and Means of Fuel Economy in Industries,"
A. I. Sheftel', 5 pp

"Za Ekonomiyu Topliva" Vol IV, No 9

The author discusses general ways and means of attaining greater fuel economy in industries. States a mathematical formula which gives the relation between fuel consumed and amount of production. Very general and does not give any specific means of increasing fuel economy.

23T25

SHEFTEL', A.

Heating from Central Stations

Central heating for cities, Zhil. -kom. khcz. 2 No. 2, 1952

Monthly List of Russian Accessions, Library of
Congress, July 1952. Unclassified

SHEFTEL', Abram Isayevich, kand.tekhn.nauk; TYLKIN, M.N., red.;
PULIN, L.I., tekhn.red.

[Power supply of Tula Economic Region] Energeticheskaya baza
Tul'skogo ekonomicheskogo raiona. Tula, Tul'skoe knizhnoe
izd-vo, 1958. 46 p. (MIRA 13:3)
(Tula Province--Power resources)

SHEFFEL', A.I.

Two accidents with heating boilers. Vod. i san. tekhn. no.1:34-35
Ja '58. (MIRA 11:1)

(Heating) (Boilers)

SHEPTEL', A.

Useful exchange of opinions. NTO no.2:61 F '59.

(MIRA 12:2)

1. Predsedatel' Tul'skogo oblastnogo pravleniya nauchno-
tekhnicheskogo obshchestva energeticheskoy promyshlennosti.
(Electric power plants)

SHEFTEL', A.I., starshiy elektromekhanik

What caused the damage of contactor coils. Elek. i tepl. tiaga 6
no.8:25-26 Ag '62. (MIRA 17:3)

45568
S/119/63/000/001/012/016
D201/D308

9.6100

AUTHOR:

TITLE:

PERIODICAL:

Sheftel', B.Sh.

A system of compensation of inertial and gravitational deviation measured by electrical pick-ups

Priborostroyeniye, no. 1, 1963, 24

TEXT:
The author suggests an electrical method of compensation using two pick-ups with identical static and dynamic characteristics. The two pick-ups are connected electrically only by means of a circuit summing the signals from the measured parameters and compensating for the above errors. The pick-ups are placed in such a manner that the gravitation and inertia effects are the same in both of them, with the action of the measured parameter on the opposite sides of them. Both pick-ups are connected to the indicating instrument by a differential bridge circuit, producing the addition of signals of the motion of sensing elements in opposite directions and read-out when they move in the same direction. The conditions for maximum compensation effect and sensitivity are discussed. The

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A system of compensation ...

S/119/63/000/001/012/016
D201/D308

above system of compensation can be used in control instruments in the measurement of pressures, velocities and forces and of electrical quantities during transients of motion and vibration. There are 2 figures. 4

Card 2/2

SHEFTEL', B.T., kand. tekhn. nauk, dotsent; LIPSKIY, G.K., inzh.;
MIRONCHIN, V.A., inzh.

Effect of the waviness of the ring race on the vibration of
a ball bearing. Vest. mashinostr. 45 no.7:49-51 J1 '65.
(MIRA 18:10)

Supplement, B, T.

"On the Problem of the Mechanical Articulated Mechanisms as Applied to the Calculation of the Control Properties of Transport Machinery." *Vys. Higher Education USSR, Saratov Antennaile and Radii Engineering V. K. Volotov, Saratov, 1955* (Dissemination of the results of Scientific Research in Industrial Science)

SP: 1955, No. 27, July 1955

SHEFTEL', B.T., kand.tekhn.nauk

Applying the method of interpolation with the utilization of
complex variables to the synthesis of a symmetrical linkwork.

Trudy SADI no.16 pt.1:75-82 '59.

(MIRA 13:11)

(Links and link motion)

SHEFTEL', B.T.; SIVYAKOV, K.M.

Modeling the corrugation profile of a rolling-bearing
race. Stan. 1 instr. 34 no.10:37-38 0 '63. (MIRA 16:11)

SHCHETIN, B.T.; KRENEV, V.I.; SICHANITSYN, A.A.

Using the recording instrument designed at the "Kalibr" Plant for
recording the waviness of antifriction bearing grooves. Izv. tekhn.
no.3:21-22 Mr '65. (MIRA 18:5)

SHEFTEL', I.

Useful book ("Uniting rubbers to metals" by S.K. Zharebkov. Reviewed
by I. Sheftel'). Kauch. i rez. 16 no.8:40 Ag '57. (MIRA 10:11)
(Rubber) (Zharebkov, S.K.)

SHEFTEL', I.

New encyclopedia "Construction materials." Plast. massy no.11:76 '63.
(MIRA 16:12)

AUTHOR: Sheftel', I.

TITLE: Conference of Representatives of the Tyre Industry From Eastern Europe and the USSR (Soveshchaniye predstaviteley shinnoy promyshlennosti stran sotsialisticheskogo lagerya).

PERIODICAL: Kauchuk i Rezina, 1958, Nr.1. pp. 37 - 38. (USSR).

ABSTRACT: This Conference was held in Moscow from the 19th - 27th November, 1957 and was attended by representatives from Bulgaria, Hungary, East Germany, Poland, Rumania, the USSR, Czechoslovakia and China. Improvements of the quality of car tyres and the use of new materials, the mechanisation and automation of the industry etc. were discussed. The Conference heard the following reports: K. Rakovskiy (Bulgaria) on "The Results of Using Viscose and Nylon Cord, Impregnated with Latex and Resorcinol Formaldehyde Resins"; Dr. Z. Brukner on "Investigations on the Bonding of Rubber and Viscose Cords, and Methods of Making Rubber Tyres"; P. Ser on "A Method of Making Casings"; Z. Barta (Hungary) on "A Method of Making Tyre Cords from Artificial Fibres"; Dr. A. Shpringer (East Germany) on "Research Work Carried Out in the Research Centre for the Rubber Industry in Furstenwald to Improve the Quality of the Tyres"; V. Vaysenborn

Card 1 3

188-1-11/16
Conference of Representatives of the Tyre Industry From Eastern
Europe and the USSR.

(East Germany) on "Tubeless Light Weight Tyres",
T. Kozlovskiya on "Improving the Wear Resistance of
Protective Rubbers"; A. Olyashek (Poland) on "Investi-
gations on Rubber Mixtures and Their Components and
Methods of Evaluating the Quality of Tyres"; G. N.
Buyko (USSR) on "Investigations of the Physico-Mechani-
cal Properties of Rubbers for Car Tyres"; V.P. Zuev
(USSR) on "The Preparation of Highly Dispersed Carbon
Black from Liquid Raw Material"; K. A. Pechkovskaya
on "Physico-Chemical Method of Evaluating the Properties
of Carbon Blacks"; R. V. Uzina on "The Impregnation of
Cords"; M. M. Reznikovskiy (USSR) on "The Determination
of the Wear Resistance of Rubbers"; B. A. Dogadkin (USSR)
on "Vulcanisation Methods for Tyre Rubbers"; N. D.
Sakhnovskiy (USSR) on "Wear Resistance of Protective
Rubbers"; A. G. Shvarts (USSR) on "Basic Physico-
Mechanical Properties of Rubbers Based on CKM in Tyre
Casings"; V. I. Novopol'skiy on "Methods of Evaluating
the Quality of Car Tyres"; V. P. Biderman (USSR) on
"Methods of Calculating Pneumatic Tyres"; M. Fisher
(Czechoslovakia) on "Methods of Determining the Strength

Caed 2/3

SHEFTEL, I. A.

Aviation fuel. I. A. Sheftel. U.S.S.R. 69,717, Nov.
30, 1947. Hygroscopic benzene and benzine-gasoline
mixts. are treated with 1-5% of BuOH, for prevention
of the sepn. of H₂O, which causes corrosion of metallic
surfaces. M. Hosh